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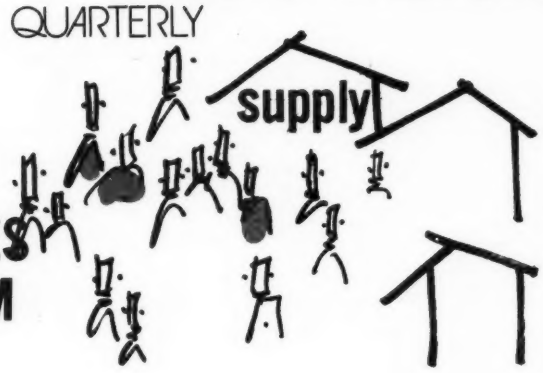
CESMET
CIVIL ENGINEERING AND SERVICES MANAGEMENT EVALUATION TEAM



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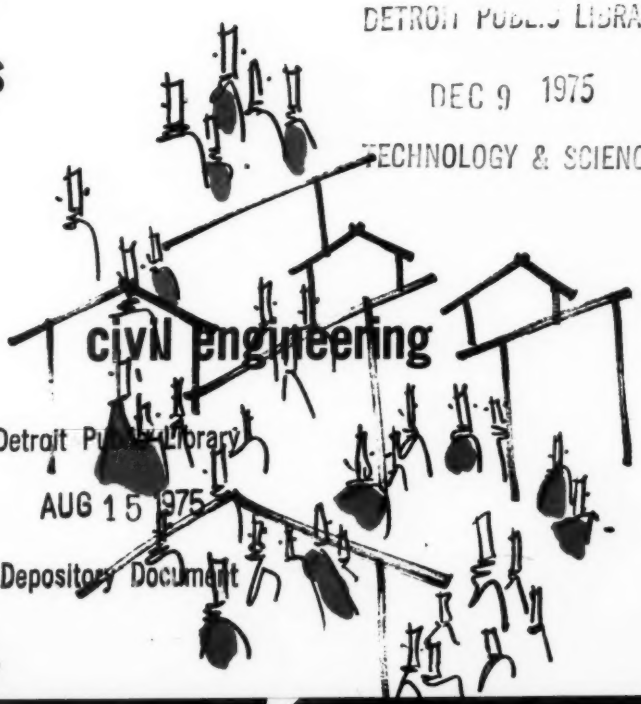

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Editors Comment: The presses were rolling when the name of the magazine was changed. Bear with us for any inconsistencies.

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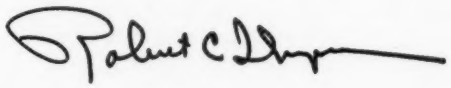
Maj Gen Robert C. Thompson
Director
Engineering & Services

From the Director

New Partners and a Name Change

In this issue we welcome some important new partners and change the name of our magazine from the **Air Force Civil Engineer** to **Air Force Engineering and Services Quarterly.**

The new Directorate here on the Air Staff (Engineering and Services) and your new organizations at the major commands have been established for the purpose of undertaking major new initiatives in service to people programs. It is an Air Force wide effort aimed at achieving significant, visible . . . and tangible . . . improvements in the day to day quality of life on Air Force installations. It is also a threshold effort with room for much improvement in many areas. My hope would be that this new partnership will help to create an environment in which fresh ideas, as well as innovative approaches, can flourish throughout the Air Force. It would also be my hope that all of you—services specialists, planners, engineers, architects, and others—will find many opportunities for improving the way we manage our business for Air Force people.



ROBERT C. THOMPSON
Major General, US Air Force
Director of Engineering & Services

An Interview

Brig Gen William D. Gilbert Is New Deputy Director

When Brig Gen William D. Gilbert assumed his newest assignment as Deputy Director of Civil Engineering, Deputy Chief of Staff for Programs and Resources, Headquarters US Air Force on 15 May 1975, it was like a homecoming for him.

Almost four years had passed since he had served in two significant positions within the Directorate. Those positions, first as the Executive to the Deputy Director for Construction and then as Executive to the Director of Civil Engineering, provided him with an insight into the inner workings of the Directorate. His participation provided a good background into the whole spectrum of the part civil engineering plays in the modern, progressive Air Force. It involved dealings at the highest policy-making level to that of the daily operations of a base.

Unquestionably, his previous experience—coupled with the knowledge he has acquired in three responsible positions he has held since leaving the Pentagon, will help in meeting the challenges of what is shaping up to be an era of significant change within the Directorate.

"It's exciting to be back," General Gilbert confided. "Several things have occurred since I was last here. One in particular is the new *AFR 85-1*. Since it has been published, it has helped make civil engineering a more finely tuned organization. It has opened up newer ways to better manage our resources and it must continue to receive emphasis as we move more and more into total people programs in the Air Force."

When he alluded to people programs, he was making reference to his recent tour as the Deputy Chief of Staff for Engineering and Services at

Headquarters Pacific Air Forces. The command's function was quickly diminishing from a wartime mission to that of a peacetime operation, he recalled. After having traveled extensively to all the bases within the command, he found that the total involvement in Southeast Asia had consumed much of the command's time and resources.

"Unplanned day-to-day operations had necessitated a deviation from the way we do business," he said. "As a result, PACAF was behind the rest of the Air Force in programs for its people. It was the opportune time to start them."

Knowing of the success within US Air Forces in Europe (USAFE) in implementing the Engineering and Services concept, it was adopted within PACAF, the second command to do so. After careful planning, a viable upgrade program was established at all PACAF bases to accommodate its people. Such projects as new and refurbished living facilities were instituted (he singled out an on-going $46 million dormitory construction and upgrade program), better recreational areas were planned, and upgraded dining facilities were initiated. "All of these programs are in various stages of progress now and have the full support of the PACAF Commander in Chief," he added.

"The meshing together of engineering and services can only make the Air Force an even more attractive service to the volunteer." he predicted. "If we give our young people a good place to work, eat and sleep, we will be sending them to their respective jobs motivated and more productive.

"The engineering and services concept gives us the total involvement in this effort," he continued. "It will be a big challenge and a tough management job as it gathers momentum. It will succeed if we work harder in our jobs. By doing so, we will develop ourselves into better managers of our resources, and I can say from my experience, it will definitely enhance our image throughout the Air Force as the responsible managers and controllers of the total people areas in the Air Force."

General Gilbert is a native of Louisiana. He received his bachelor's and master's degrees in business / management from George Washington University, Washington DC.

He entered the Civil Engineering career field in 1963, serving as the Base Civil Engineer at Davis-Monthan AFB, Arizona, and then in the same capacity at Moron AB, Spain. He next attended the Industrial College of the Armed Forces in 1966.

Upon graduation, he was assigned as Executive to the Deputy Director for Construction, and in 1968, became the Executive to the Director of Civil Engineering. In 1971, he was named the Director of the Civil Engineering Center at Wright-Patterson AFB, Ohio, and a year later, he was assigned Deputy Chief of Staff for Civil Engineering, Headquarters Military Airlift Command, Scott AFB, Illinois. In 1973 he was named Deputy Chief of Staff for Civil Engineering (1 Sept 1974 becoming Engineering and Services), Headquarters PACAF.

Welcome home, General!

C&S

CESMET (Civil Engineering and Services Management Evaluation Team) is now an important addition to the way we conduct the business of Air Force Civil Engineering and Services. The Headquarters US Air Force CESMET is several months old at this writing and is visiting bases world wide. We have already visited with some of you. Major command teams are also being established and some are already on the road. Their method of operations should parallel that of the US Air Force team. The US Air Force team is manned with a team chief and two civil engineers, with representatives from Budget, Procurement, Supply, Transportation and Services. Team members are qualified, motivated and have extensive base level "combat" experience in their respective functional areas. Perhaps most important, CESMET provides a "fresh look" at how our business is conducted. Our mission is global; our Air Staff charter well-defined.

Over four years ago, CESMET was born as a management innovation at Headquarters 2nd Air Force, Barksdale AFB, Louisiana, then under the command of Lieutenant General David Jones. Recognizing that 40 to 60 percent of a base's operations and maintenance funds (excluding civilian pay and facility projects by contract) were processed through, or directly managed by, the Base Civil Engineer, 2nd Air Force leadership was concerned with the allocation and management of these sizeable resources and their impact on people living, working and playing on their Air Force bases. Civil engineering was big business in terms of capital investment, maintenance, supply and personnel costs and it required an appropriate share of management attention. The CESMET concept was sired by 2nd Air Force to provide an objective evaluation of how these civil engineering resources were managed.

As the concept evolved, CESMET matured and became an integral part of management philosophy. It is used extensively

and successfully in US Air Forces in Europe. CESMET was conceived, developed, tested, and has proved to be valuable over a period of four years; more than 250 bases have been visited. The Air Staff recognizes CESMET as a rational (even the preferred) approach to the management evaluation of base support functions.

As we all know, the scope of the Civil Engineering and Services effort is formidable. Air Force installations cover almost 11 million acres of land—larger than the states of Rhode Island, Connecticut and Massachusetts combined. This land accommodates facilities and facility systems that cost the taxpayer about $17 billion. These assets beg for professional maintenance—maintenance that costs over $1.2 billion annually. Our job is to spend these annual resources prudently. We must keep our facility assets "healthy." It would cost over $50 billion to replace them. Services activities add to the complexity of our management tasks. We have over 700 dining facilities; 147,600 units of family housing; 173 commissaries; plus base exchanges, mortuaries, linen exchanges and clothing stores. Big business? Needs management attention? You bet! CESMET is the appropriate vehicle to evaluate the management of this big business and its contribution to mission accomplishment.

The charter of CESMET is to evaluate management results, not necessarily procedural compliance. We are concerned with what is coming out the end of the production pipe. Compliance is not discussed unless it is blocking progress; that is, only if it is part of our contribution to the problem. We are an "Air Staff policy arm in the field" looking at the effectiveness of Headquarters policies at base level, eliminating or altering policies that are either ineffective or counter-productive or both. Simply stated, CESMET is looking at the product, the things that make money and that make life better for all people assigned to the base.

CESMET provides management services to any base organization. All support areas are examined during our visits with particular emphasis directed at the interrelationships of support functional areas and civil engineering. The civil engineer is acutely dependent on the adequacy of his funds, procurement, supplies and

cont'd next page

CESMET *cont'd*

transportation. CESMET provides vertical evaluation, but because of its multi-functional membership, it also provides horizontal evaluation across functional areas and gives commanders a better look at the "big picture."

The CESMET philosophy has two critical parts:

- We are not inspectors checking compliance; and
- We are not ad hoc—members are permanently assigned.

These two aspects of CESMET make us a unique team and add to the success of our management evaluation and assistance efforts. The team does not have checklists, preconceived ideas, nor does it have a "scorecard." Our members perform as management consultants rather than as headquarters inspectors. This free lance and unstructured approach provides the team with the flexibility to focus on the real issues at the base. Each base has its own unique management "personality." Our approach is sufficiently flexible to permit us to react to this "personality."

CESMET provides alternative ways to a base in order to show people how to do their jobs better with the management tools already available to them. Our goal is to leave base personnel more knowledgeable and motivated, rather than floundering and discouraged. For example, you will find our team members where you would seldom expect to see Headquarters US Air Force personnel—in the back room with sleeves rolled up, sitting with a lieutenant, sergeant or civilian, offering each of them solutions to their problems and, in some cases, showing them better ways to conduct base level business. Our team recognizes that the best evaluation in the world is useless by itself; to be effective we must communicate and motivate.

The concept of operations of a CESMET varies by base but generally a base visit lasts three or four days. It begins with a short in-briefing presented by the CESMET chief to the base personnel. This session provides the base an opportunity to surface problem areas that they would like the team to address. The team does not have any unique requirements and discourages any special preparations prior to the visit. The whole idea is to preclude levying additional workload on the base personnel. We try very hard to be as self-sufficient as possible in order to minimize the disruption.

The visit ends with a rather lengthy out-briefing for the wing and base commanders and for key members of their staffs. The briefing is presented from a deck of 5 by 8 inch cards containing pertinent notes for the briefer, basically cue cards. A copy of the card deck is left at the base only as a reminder of the issues discussed. No paperwork is required of the base. One of our major goals is to reduce paperwork Air Force wide. To this end, we leave no report and expect no response from the base. We would hope that commanders would cooperate with our goal to reduce paperwork and not require written followup actions subsequent to our visit.

"CESMET team members perform as management consultants . . . not as Headquarters inspectors."

"CESMET looks at the product, the things that make money and that make life better for all people."

At the out-briefing, problem areas are discussed in detail, but more importantly, appropriate solutions to identified problems are offered—not directed. If the team is unable to solve or to indicate to the base an appropriate solution, the team will take the issue to the host major command or to Headquarters US Air Force for analysis and final resolution. Topics covered during the brief-out are not confined to civil engineering. We also address functional interfaces in other base organizations which have an impact on civil engineering or on the total base mission. Good things that have been observed are also noted, to include the recognition by name of outstanding individuals. Finally, there are no surprises at the out-briefing. All issues surfaced will have already been discussed in detail with the person directly involved.

We are not looking for instant cures for weak areas. We are looking for progress and improvement relative to the better management of Civil Engineering and Services resources. We consider the most important ingredients of this better management an increase in the productivity of the work force, the

rational allocation of resources, and an appreciation of the end product—service to our customers.

CESMET is in the business of helping bases fight the mismanagement of decreasing resources using evaluation, consultation and motivation. This is particularly appropriate as we wrestle with a post-Southeast Asia Air Force in a management environment that will have additional personnel reductions, rising material and labor costs, and reduced funding in terms of buying power. We are perhaps faced with unparalleled peacetime challenges. We must therefore turn our backs on past inefficiencies and face these new and demanding challenges. We need imagination, innovation and determination.

CESMET is in the business of helping bases fight the mismanagement of decreasing resources using evaluation, consultation and motivation.

Over 20 bases have been visited by the US Air Force CESMET. Many good operations have been observed.....few were not so good. The feedback from our initial visits has been encouraging; our track record to date looks good, including an unsolicited letter from a commander who is now a believer. We have been particularly pleased with the acceptance and attitude of the people we have visited and look forward to visiting with you.

C&S

COLONEL ELLIS *is Chief of CESMET, Headquarters US Air Force. He earned his bachelor's degree in engineering at the US Military Academy and his master's degrees from Arizona State University and George Washington University. He is a graduate of the Industrial College of the Armed Forces and a member of the Society of American Military Engineers.*

When the base prospers from a CESMET visit, so does the entire Air Force

Our Civil Engineering job is tough and getting tougher! Requirements remain essentially the same at a time when our purchasing power and people resources are declining. We will have to do "more with less." Difficult? Obviously . . . but to survive this paradox, we must work smarter—not just harder. An important part of the survival package must be management innovation—new and better ways to increase work force *productivity!* CESMET is one technique that focuses management attention on that elusive issue—productivity.

The lead feature article in this issue of the *Air Force Engineering and Services Quarterly* describes in detail CESMET's genesis and method of operations. It is not a new concept; it represents the product and experience of over 200 base visits. I am pleased with the CESMET concept and its accomplishments. Team members have successfully attacked some important money making topics. Often seemingly insignificant observations of Headquarters' policy lead to further in-depth analysis which unexpectedly pay big dividends.

For example, at one of the bases visited, a road grader was being sent to salvage because it needed a new clutch costing $700. The decision to salvage this grader was based on Air Force policy which set a limit on one time repair cost for equipment at five percent of its original acquisition cost. The grader in question was purchased for $11,000 several years ago which set the limit of one time repair at $550; however, the current replacement cost of this item was now in excess of $30,000. CESMET questioned the wisdom of both the policy and the decision. This led to subsequent evaluation and revision of the Air Force's equipment repair policy. Salvaging is now based on 10 percent of the replacement cost; $3,000 versus $550 in the above example.

Dollar savings for the Air Force with this typical observation is difficult to quantify, but CESMET obviously earned several times its salary. Too often, we find base level management deeply involved in solving day-to-day crises, sometimes too close to the problems, and therefore, they often fail to question policy emanating from higher headquarters. CESMET has the capability to give the base operations a "fresh" look—a look which is not only beneficial for the base but also beneficial for the Air Force. CESMET brings together a group of experts from different functional support areas—civil engineering, procurement, services, budget, transportation and supply—who have extensive base and staff level experience. The team gives each base a week of its undivided attention, a week where they roll up their sleeves and work with base personnel to uncover and attack nagging problems.

The success of CESMET can be attributed to teamwork—teamwork between CESMET and the base. The team works particularly hard to eliminate any adversary relationship with the base people. Members don't get a "kick" out of finding problems. The objective is to solve problems and put the good of the Air Force first. We want to gear up efficiency, to leave no stone unturned, to bring about the fullest and most effective results. When the base prospers from a CESMET visit, so does the entire Air Force and that's the "name of the game."

CESMET is here to stay! Major command teams are already conducting visits using the same techniques as the Air Force team. Look forward to their visits. Vital to a successful visit is your cooperation. Much can be achieved if we all recognize that we are all in the same business, pulling for the same goal—a better and more productive Air Force.

Maj Gen Robert C. Thompson

When we "just get the job done," when we perpetuate "crisis management," or when we manage by exception, more properly called "neglect," we aren't producing a dollar's worth of service for each dollar we spend. Managing our in-house work force is not an easy task, but it is not an impossible one. Here are some timely tips on . . .

How to Increase Work Force Productivity

by Lt Col Norwood J. King

Editor's Note: The following article is a condensation of a presentation made by the author at the Pacific Air Forces Command Base Civil Engineering Conference.

The way we use our resources is becoming more critical. To put it bluntly, the war is over! The increased amounts of manpower and dollars that Pacific Air Forces (PACAF) and several other major commands needed and had access to during the Vietnam conflict are now things of the past. We had a "fly and fight" mission to support, and the lives of a lot of people were dependent upon our capability to respond rapidly to mission support facility requirements. We stockpiled materials; we planned the job while we were accomplishing it; we had enough people; and we got the job done. Cost, while important, was not the major consideration. Crisis management was a way of life. We learned to react, to be flexible, and civil engineering did one heck of a job. But, "getting the job done" became the way of doing business in the Pacific areas for almost eight years, and habits are hard to break.

We no longer have plentiful resources. Instead, we have a fixed budget and limited manpower, both of which are becoming more fixed and limited each year. We can no longer afford to *just* "get the job done;" we must do it economically. If we don't do it economically, then we just may be replaced with someone who will!

If civil engineering activities are to become more efficient and effective, to be more competitive with commercial forces, we must increase the productivity of our in-house forces. How do we do that? How can we provide better service with the dollars and manpower that we have? There's only one answer,

Planning is the process of selecting the best course of action to accomplish an objective.

Organizing is the process of defining how we are going to make best use of resources to accomplish work requirements.

through better management, by improving our application and execution of sound management techniques and procedures. Most of us are engineers of one kind or another by education. But, the Air Force isn't paying us to be only engineers. We are also paid to be managers, and until we decide to really manage our resources, rather than react with them, we will be subjected to criticism, and rightfully so!

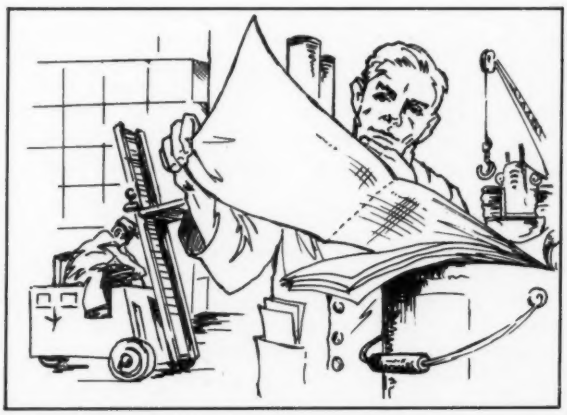
There are five basic functions involved in managing: planning, organizing, coordinating, directing and controlling. *Planning* is the process of selecting the best course of action to accomplish an objective and involves analyzing the work requirement, determining the method of accomplishment, formulating the work plan, and identifying the resources needed to accomplish it. *Organizing* is the process of defining how we are going to make the best use of our resources to accomplish work requirements. In our business, the word "programming" is more often used. We program our work requirements to make maximum use of available resources. *Coordinating* is the process of making sure that everything needed by our craftsmen is ready when they begin work on the job. In our complex type of operation, we have to mesh all related activities together at the proper time and in the proper sequence to efficiently accomplish our work, and this requires coordination. Really, it's communicating—upward, laterally and downward within the Base Civil Engineer (BCE) organization. These first three functions of managing are complex, but *AFR 85-1* tells us how to do it, and tells it well!

Area Where Management Breaks Down

Directing logically follows the first three functions. It's simply putting the plan, which has been programmed, organized and coordinated, into effect. We call it "scheduling." This is the area where the management of our work force begins to break down. Directing or scheduling of work *cannot* be effective until the work has been planned, organized and coordinated to mesh with other requirements and available resources. Yet, we bypass those functions continually because of what we call "command interest" work. It is recognized that when the wing commander tells the BCE to do something, the BCE is going to do it, if at all possible. We're going to have command interest jobs, and sometimes we won't be able to take six months to plan, program, etc. But, if we stop supervisors (deputy BCEs all the way down to shop foremen) from initiating an excessive number of rush jobs, we can be flexible enough to take care of the bona fide command interest jobs without keeping our organization in a constant turmoil. We have found that less than 10 percent of the "command, rush, and priority" jobs are directed by the base or wing commander. So, we're really doing it to ourselves. We're perpetuating crisis management!

Controlling is the area in the management of our work force that is probably the least understood, and certainly is the least used. It involves two fundamental actions. First, it involves evaluating activity performance. In other words, is the operation or job proceeding the way it should? Secondly, it involves determining and taking the appropriate action to bring the activity back in line, to make it perform in a more efficient and effective manner. No matter how well we *think* we *may be* performing the first four functions of managing, if we neglect controlling, we really have no way of determining how well the first four are *actually* being performed.

Some people substitute "management by exception" for controlling. In the management of our work force, management by exception simply *will not* work! Exception management can only be effective when there is a system available that will identify performance deviations from established standards, and that will provide the manager an avenue to correct the problem. This system works well for an assembly line operation that produces so many gidgets a day. We don't produce gidgets. Our activities involve all kinds of work, scattered all over the base; and no one has been able to come up with a valid index, performance measurement, or standard that can be applied to all forms of civil engineering output. Consequently, controlling is particularly important in managing civil engineering resources. It's the best way we have of identifying inefficient performance and then improving that performance. Each of us is entitled to develop our own style of managing; but if it is going to be effective, that style must be built around the basic management principles, which certainly include controlling. Otherwise, we won't be effective managers.



Coordinating is the process of making sure that everything needed by craftsmen is ready when they begin work.

When the July 1972 edition of *AFM 85-1* was published, it included a new concept of positive work force control, more commonly called the controller concept. The purpose of the controller concept is to increase work force productivity, by providing the

cont'd next page

Productivity *cont'd*

foreman a means of really *managing* his work force. In other words, it provides a way for him to apply the five basic functions of managing.

At the weekly scheduling meeting, the foreman finds out what work his people have to do the following week. Then he has to plan the work. How many people are required on each job? Is any special equipment needed? Does a job require special talents of some particular craftsmen? In other words, he determines how the job should be done and what is needed to do it, in terms of his resources.

Then, he meets with his controller and programs his plan for the coming week. Sequence of jobs, number of people required, special equipment, and so on, are discussed and recorded. The importance of this phase cannot be overemphasized. This is where the foreman communicates his plan to the controller. If the foreman doesn't plan his work, or doesn't relate it to the controller, there's just no way that the controller can effectively do his job. But, if the foreman and controller do a good job of programming the work, they have the battle half won. Then, when the inevitable deviations come up, they can be accommodated without creating a panic.

Controller Coordinates Functions

Prior to July 1972, what little coordinating that was done was usually done by the foreman. The controller does this now; he's the focal point for obtaining support for the craftsmen. He performs the coordinating functions in managing craftsmen, calling on the superintendent or foreman when major decisions must be made or to resolve problems beyond his capability to resolve. The controller, as the agent for the foreman and superintendent, maintains continual contact with the craftsmen and directs them from one job to another. If the foreman has properly planned and programmed his work, the controller is simply carrying out what the foreman desires. The controller can be thought of as the foreman / superintendent's executive officer. He takes care of the coordinating and directing details, which allows the foreman and superintendent to spend more time on the planning and controlling of the work. Thus, when I hear a foreman complain that he doesn't like the controller concept or that it reduces his authority, I know that the foreman either doesn't understand the system, know how to manage, or doesn't want to manage.

The controller concept was designed to give the foremen and superintendents the opportunity, and the means, to properly manage their people, and through better management, to increase the quality and quantity of in-house performance. We haven't attained the objective so far. Most foremen and superintendents are either craftsmen, equipment operators, or plant operators by trade or education.

Directing is putting the plan, which has been programmed, organized and coordinated into effect.

Over the years, they've been moved up into supervisory positions and were expected to become managers, which in many instances just hasn't happened. The people who developed *AFR 85-1* evidently recognized this because they wrote it so that, *if followed*, it will channel the efforts by supervisors toward management of their work force. It contains detailed procedures on how to plan, how to program, how to coordinate, how to direct, and to a lesser degree, how to control. *AFR 85-1* is not the ultimate answer to all of our problems, nor is it a perfect system. But, it is an excellent system, the best we've ever had, and if we use it, it would certainly help us to effectively manage our in-house resources and increase productivity.

What can you, as incumbent or future BCEs do to improve the management of your work force? You don't have enough hours in the day to visit every job site, and to plan, program, coordinate and direct every aspect of work force activity. But, there are several things that you can do that could make a tremendous improvement in the overall operation of your organization.

First, you can improve work force productivity by emphasizing and supporting *AFR 85-1* procedures. We all know that water flows downhill; it just doesn't run up a hill. Interest "flows" the same way. If you are interested, and show that interest, your people are going to be interested too. But, if you aren't, subordinate supervisors aren't going to be very interested either. And that worker, no matter how eager he once was, is going to find out real fast that he's putting out a lot of effort to do a job that no one has any interest in, and he isn't going to continue doing it very long. To show your interest, you have to communicate with your people, and it has to be done continually. A one-time pitch at commander's call or the weekly staff meeting won't do it. You have to follow with reminders, appropriate question, review of performance, rewards for people who are doing the job right, and reprimands for those who don't.

You have to tell them what you expect from them—that each and every person is going to read *AFR 85-1*, become familiar with the overall system,

and become thoroughly knowledgeable of the parts that involve his function. You have to tell them what you want them to do—that they are to closely examine their operation and make it function the way it should. Make sure the foremen know that you expect them to plan and program their weekly and daily work, use the controller, get away from their desks, and properly supervise and control their craftsmen on the job site. You have to insist that people stop by-passing the management system with "rush" jobs. You also have to let them know that you'll be following up, and then do it.

The second thing you can do to improve work force productivity is to properly use your subordinate supervisors. You can't personally oversee everything that goes on in your organization. So, you must depend upon your subordinate supervisors to do their job, to effectively manage their portion of the overall civil engineering activity. But, before you can do that, you have to determine what you really want that supervisor to do. Then you have to tell him what you expect from him and his section or shop.

For example, do you really want your Chief of Program Development, Deputy Chief of Programs, and Chief of Programs to all be primarily interested in and almost totally involved in programming projects for contract accomplishment? This is the situation at some bases. If we ask any one of these three persons a question about In-Service Work Plan (IWP) or what the work authorization specialist does, we usually get referred to sergeant "so and so" for the answer. But, if we ask about some project detail or status, all three readily answer the question!

Little Attention Given

Programming of projects is certainly a very important function of civil engineering. But, there are other functions within programs that are equally important, yet too often they receive little attention from the chief or his deputy. The point is, do you really need two or three top supervisors managing projects, almost to the degree of "over-kill," and almost completely neglecting the other critical functions of programs? This example can be applied throughout the organization.

How do you use your deputy BCE? Is he involved primarily in the same things that you are? If he is, then he really isn't helping you manage the civil engineering operation. Is he functioning primarily as a Chief of Engineering and Construction or Chief of Programs? If he is, do you really need two "chiefs" of that function? Instead, why not use your deputy to help you manage those functions that you can't become actively involved in? If he's just your shadow, doing primarily the same things you do, or if he is usually found behind his desk signing out routine correspondence, or if he's almost totally involved in one particular activity, then you need to take a hard look at what you really want him to do, and get him doing it.

The third thing that you should do is actively control your organization. This is your primary

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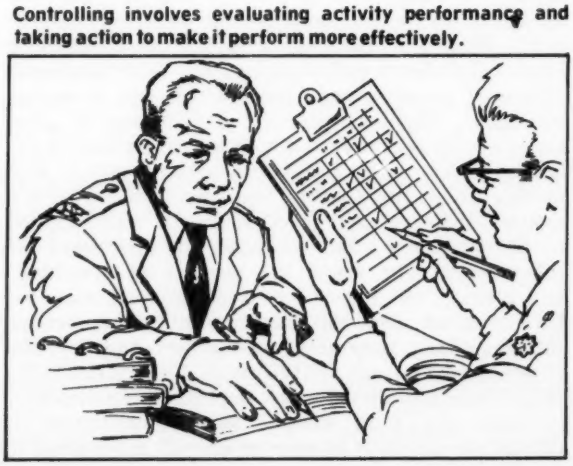
responsibility as a BCE. You're the guy ultimately responsible to make sure your organization is performing the way it should be. As mentioned previously, controlling involves two basic actions, evaluating activity performance and taking appropriate action to make the activity function effectively. These two actions must be performed continually. If poor performance is not identified, there's no way to take corrective action. If poor performance is identified, but appropriate corrective action is not taken, then you have wasted a lot of time identifying the problem. You're not really managing and there's a pretty good chance you're going to end up with ulcers! A good quality control program will help you evaluate performance; a good Management by Objectives program will help you take the appropriate corrective action. Effective use of these two programs is prescribed to preclude those ulcers!

The American taxpayer has a right to expect a dollar's worth of service produced for each dollar we spend. When we "just get the job done," when we perpetuate "crisis management," or when we manage by exception, more properly called "neglect," we aren't producing a dollar's worth of service for each dollar we spend. Managing our in-house work force is not an easy task, but it is not an impossible one. By properly using our subordinate supervisors, by really using the existing management systems, and by effectively controlling our operation, we *can* get the job done—and do it *efficiently*. E&S

Controlling involves evaluating activity performance and taking action to make it perform more effectively.



Worth Noting

Having Trouble Explaining Allowable Gross Loads? This May Help!

The Air Force Civil Engineer determines the load carrying capabilities of airfield pavements using techniques developed during the past 30 years. From record drawings, construction quality control logs or actual physical testing, he determines the engineering properties of the entire pavement structure starting with the natural soil subgrade and all layers up to and including the pavement surface itself. With this data in hand, he calculates using empirically developed relationships, the maximum allowable gross aircraft loads which the pavement can carry. These calculations yield maximum gross loads for various aircraft which are a function of the landing gear types and configurations (since gear configuration, tire spacings and tire pressure or tire contact area are used to compute the loads applied to the pavement) and frequency of operations. In other words, the fewer the number of operations anticipated, the heavier a given aircraft may be. Briefly stated, with this information, he can predict the remaining pavement service life and forecast replacement / reconstruction / strengthening requirements. Here are a few important definitions.

First, the term *normal* aircraft operations is defined as the usual number of aircraft movements to be expected when the airfield is handling the *maximum* number of aircraft for which it was geometrically designed (i.e., all apron space, hardstands, alert facilities, etc., are being fully used). Such a condition might exist during an exercise when the combination of transient and base mission aircraft *SATURATES* the airfield with aircraft and aircraft movements. With this definition in mind, an explanation follows on the various operational categories generally considered when evaluating airfield pavement and load carrying capacity.

Capacity: *Unlimited* operations for a period of more than 10 years. There is no limit to the number of aircraft operations.

Full: *Normal* aircraft operations for a period of one to two years. This means the field is saturated with aircraft.

Minimum: *Normal* aircraft operations for a period of four to six months.

Emergency: *Normal* aircraft operations for a period of two to three weeks. The emergency operational category is not for the one-time landing of a heavy airplane for Armed Forces Day, or the once-a-week landing of the Med-Evac C-141; it's for a couple of weeks of "wall-to-wall" aircraft operating every day.

Don't forget that probably the most important factor in the evaluation of any existing pavement is a careful, thorough examination by an experienced engineer. He studies its condition, its deformation, crack and failure patterns in relation to its age, the usage it has already experienced, and the past and future effects of frost action (when appropriate). The final evaluation must take into account the results of this inspection.

Three Civil Engineer Officers Selected for Service Schools

Three Air Force Civil Engineers have been selected to attend senior service schools, it was announced recently. Maj Hermann F. Englebach, Jr, Headquarters US Air Forces in Europe, Maj John R. Harty, Air Force Civil Engineering Center, Tyndall AFB, Florida, and Maj Frank R. Zahniser, Headquarters US Air Forces in Europe, will attend a school at a place and time to be announced.

Information published here is designed to keep civil engineering personnel aware of late developments and significant trends within the career field.

CURRENT EMPHASIS

COLOR IN FACILITY DESIGN--The Air Force is concerned about improving the environmental quality of its facilities by diversifying interior color and exterior surface material selection. In a letter addressed to all MAJCOMs on 3 June 1975, the Director of Civil Engineering outlined steps to be undertaken to implement a program to create more dynamic, "livable" environments through the use of color.

FY 76 FAMILY HOUSING ENERGY CONSERVATION PROJECTS--Projects totaling $14.3 million have been authorized for design at 45 bases. Projects range from simple features such as added insulation to complex fuel conversions. Annual savings in excess of $3 million is expected based upon an average amortization period of five years.

INTERGOVERNMENTAL COORDINATION FOR AICUZ--In order to fully coordinate Air Installation Compatible Use Zone (AICUZ) activities among Air Force bases and with other government agencies, a 27 May 1975 Director's letter to MAJCOMs established the requirement to appoint base-level AICUZ officers for intergovernmental coordination and to establish AICUZ intergovernmental Coordination Steering Groups where more than one base is located within the same geo-political area (municipality, metropolitan area, region or state). Federal regional coordination will be accomplished by the recently appointed AICUZ Coordinators at the Air Force Regional Civil Engineer offices (Atlanta, Dallas and San Francisco), working with base officers and steering groups.

LATENT DEFICIENCIES--Built-in maintenance problems in the Military Construction Program are sometimes repeated because they are not reported. Although AFR 89-1 includes reporting latent deficiencies, few are ever forwarded to Headquarters US Air Force. A special request is at MAJCOMs to review recent construction to identify design and construction features that result in high or frequent maintenance and recommend alternate solutions.

MANPOWER REQUIREMENTS--Expose your validated civil engineering deficit manpower requirements to Headquarters US Air Force on a priority basis under RCS: HAF-011 reporting. See AFM 26-1 (Change 1), paragraph 7C (2), or your local manpower and organization representative for details.

AFFF CAP REMOVER--A tool specifically designed for rapid removal of the caps from five gallon AFFF containers has been approved for inclusion in TA 490. Use of the tool will decrease the time required for resupply/servicing of vehicles during fire fighting operations.

CHANGES IN POLICY ON HEATING SYSTEMS--An AF/PRE MAJCOM letter, 4 June 1975, prohibited installation of all types of electric resistance heating (including indirect methods) for space heating or for reheat for all personnel comfort application.

AFIT EDUCATION PROGRAMS--Application cutoff for FY 1977 (continued next page)

programs was 1 July 1975, but late applications may be considered by AFMPC in the spring of 1976 for program vacancies. See your Education Office to request an AFIT education evaluation and information on registration for the Graduate Records Exam. If your career development plans include an AFIT program, establish your eligibility early.

WARRANTY REPAIRS FOR FAMILY HOUSING--Procedures for accomplishing warranty repairs for new family housing units need to be established prior to the departure of the prime contractor. Needless delays and the expenditure of vital base civil engineer manhours may result if timely working relationships are not formed. Use the warranty and not in-house manhours.

WILLIAM H. BORDNER AWARDS--All civil engineers at base and command levels are reminded that nominations for the FY 1975 William H. Bordner Awards are required to be submitted to AF/PREEU by 1 September 1975.

WORKLOAD FACTORS--Workload factor reporting during recent manpower standards application needs improvement. Example: Would you believe that square feet of floor space did not change at 16 bases from FY 1974 through FY 1977! If your workload factors are inaccurate, you will not get the manpower needed to do the job.

SAFETY DEVICES FOR STRUCTURES--A joint Headquarters US Air Force Civil Engineering Safety, Logistics and Commands message has been dispatched to MAJCOMs defining towers, poles and structures that must be equipped with safety devices. Existing structures are to be retrofitted and specifications for new items must contain these requirements.

TEMPORARY LODGING QUARTERS (TLQs)--TLQ construction is now complete. Completion of the 241 unit project at six Northeastern region bases closes out the 1001 unit TLQ construction program at 24 CONUS bases. Going PCS? Check with your gaining organization to ascertain TLQ availability.

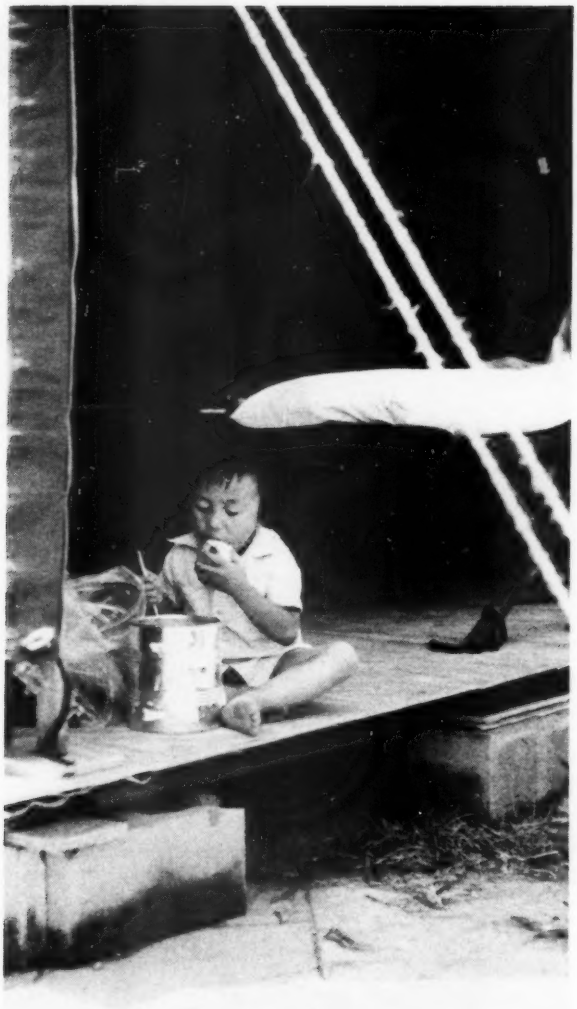
AFR 93-5--Change 1 to AFR 93-5 (Airfield Pavement Evaluation Program) was published 25 April 1975. The change established a system for obtaining and reporting the traction properties of runway pavement surfaces on worldwide airfields which have a present or potential Air Force mission.

EMERGENCY REPAIR KIT FOR LEAKING CHLORINE CYLINDERS AND/OR TANKS--Section V, paragraph 5.3a 2(6) of AFR 67-12, Storage and Handling of compressed gases and cylinders recommends use of Chlorine Institute Emergency Kit, Type A, for sealing chlorine cylinder leaks.

OVERSEA VOLUNTEERS--AF Form 90 is the means used to volunteer for oversea duty. An officer is considered a volunteer until a new AF Form 90 is submitted, indicating non-volunteer status. Once selected for an oversea assignment, an officer may not withdraw his volunteer statement (AFR 36-20, paragraph 4-4).

TELEPHONE EXTENSIONS CHANGED AT CIVIL ENGINEERING SCHOOL--A new rotary telephone exchange system has been installed at the Civil Engineering School, Wright-Patterson AFB, Ohio. All incoming calls to the Department of Education Evaluation and Research, the Air Force Civil Engineer journal and for Student Operations should be dialed on 52156. All calls to members of the faculty should be dialed on 52376. The 52004 extension for the Director, Deputy Director and Executive Officer remains the same.

Special Report
EGLIN REFUGEE CAMP



This aerial view of the Tent City was taken at the completion of the first increment, prior to first arrivals.

Air Force Civil Engineers, together with Supply, Procurement, Transportation and other personnel, worked long hours under conditions less than ideal to build a city in FIVE DAYS for a population of 5,000 people, starting with nothing but sand and pine trees. They did it and here's the report on how they provided the new residents with a comfortable . . .

Transition to a New Life

by Maj P. A. Peckham, PE, Capt P. G. Arnold and Capt J. L. Davis, EIT

Word was received on 27 April 1975 that Eglin AFB, Florida, home of the Armament Development Test Center (ADTC), commanded by Maj Gen Henry B. Kucheman, Jr, had been selected as a possible site for processing refugees from Southeast Asia (SEA). A thorough comparison of available facilities versus mission requirements made it clear from the beginning that although Eglin AFB had ample land area, it completely lacked housing for even a few hundred refugees. Several abandoned auxiliary fields were considered. All had been constructed during World War II and were inactive. Each had a serviceable road system, questionable water and sewage systems, and a runway/taxiway system in varying stages of deterioration. The ADTC mission dictated the use of Auxiliary Field #2 which is located five miles north of the city of Niceville on State Route 285 and approximately 10 miles north of "Eglin Main."

Auxiliary Field #2 was constructed in 1942 and had been used briefly during the early days of the Vietnamese action for training RED HORSE personnel prior to their deployment to SEA. It had been evacuated in November 1973 at which time all

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vertical structures, including electrical poles and wiring, were leveled. The water system, including the 75,000 gallon elevated storage tank and one of two wells, remained intact as did the sanitary sewer system. The sewage disposal system consisted of a gravity flow collection sewer and an Imhoff tank with a percolation field. Approximately six months prior to being selected as the site for the Eglin Refugee Processing Center (RPC), Field #2 had been chosen as the site for a research and development test. A small well had been dug to provide drinking water and a sewer main cleared for disposal purposes. Three 50 by 10 foot trailers were sited on the south edge of the old airfield parking ramp, and they formed the nucleus for the center's administrative facilities.

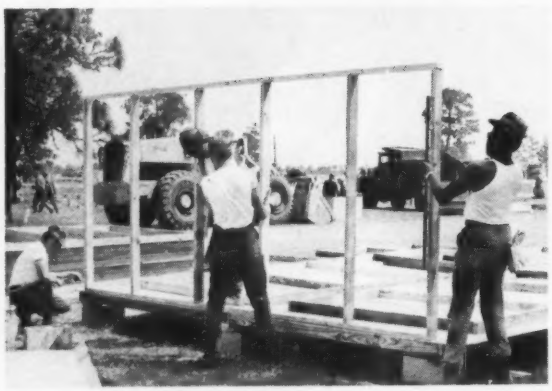
The initial guidance provided by Headquarters US Air Force was to plan for housing up to 20,000 refugees. Although this number was later cut back to 2,500 and subsequently expanded to 5,000, it was obvious that we were in a race against time as the first refugees were due to arrive within five days.

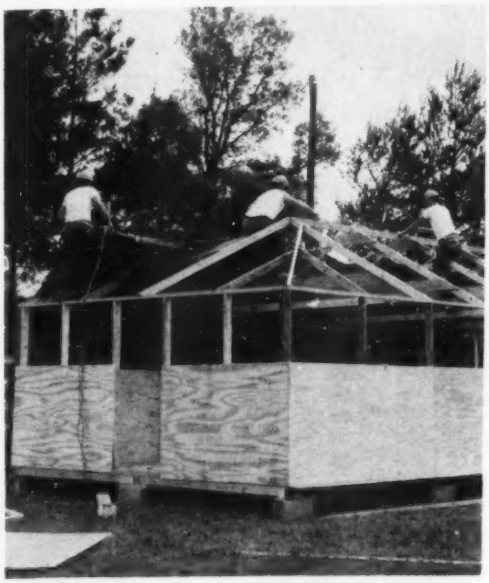
On 28 April, a decision was made that this would be a joint venture with Tactical Air Command (TAC) and Air Force Systems Command (AFSC) pooling their resources to get the job done. A New Arrivals Task Force was organized under the direction of TAC's Maj Gen Howard M. Lane, Commander of the Tactical Air Warfare Center at Eglin AFB. It was tasked with the construction of the Tent City and all facets in support of the civil agencies and volunteer groups engaged in refugee resettlement.

Col John P. Thomas, Assistant DCS/ Engineering and Services, Headquarters TAC, was named to coordinate the civil engineering effort. He arrived at Eglin AFB late on 28 April; and after an all night session with key civil engineering personnel, a plan emerged. The primary structures to be used would be basic hardback tents as described in *AFM 86-3* and modified for more advanced construction practices. Under the concept of operations, the following were the responsibilities of all civil engineering personnel:

- Personnel from the 3202 Civil Engineering Squadron (CES), Eglin AFB, would prefabricate modular wall and floor panels and trusses.
- Crews from the 823 CES (HR), Hurlburt Field, would erect tents in the field.
- Utility crews from Eglin AFB would restore existing utilities and extend the systems as required by the final population of the RPC.
- The 834 CES, Hurlburt Field, would provide the necessary interior modules for latrine and laundry tents, and with augmentation from TDY Prime BEEF personnel, accomplish field installation and final plumbing work in latrines, laundries and showers.

Eglin AFB personnel were also tasked with all material identification and ordering, and all engineering support requirements.





Civil engineering personnel are shown during various stages of erection procedures as work moved along swiftly. Within days, Tent City began to take shape and these facilities were almost complete when the first refugees arrived.

Utilizing the basic design for hardback tents, the Eglin AFB shops constructed a model tent. It was used to test prefabrication techniques, to insure suitability for planned usage and to confirm final material requirements. Through careful study, it was determined that the tent structure could be simplified, resulting in considerable savings in material and in manhour requirements in the fabrication and erection phases. Even with the simplified design, each hardback required about 750 board feet of 2 x 4s and 22 sheets of plywood, plus miscellaneous hardware and lumber.

From the model tent, it was determined that maximum efficiency could be obtained through the use of prefabrication techniques and the use of assembly lines for construction. Construction was speeded through the use of jigs and pneumatic hammers to enable rapid placement and joining of section components. After determining the site and material requirements, the next task was to order all necessary items for prefabrication and construction, including all the required tools. Eglin AFB and Hurlburt Field Supply and Procurement agencies were tasked to their limit and responded in an outstanding manner to provide over 15,000 sheets of plywood; 5,000 pounds of nails; 10,000 feet of plastic pipe and assorted connections; 25,000 concrete blocks; and three-quarter million board feet of 2 x 4s.

The camp was laid out in increments corresponding to the planned arrival sequence of the refugees. Each tent would house a maximum of 12 people. An increment would contain approximately 70 tents and would contain sufficient shower tents, laundry / ironing tents, and latrine tents to support the planned population of that increment. For the shower, laundry and latrine tents, a basic tent structure was to be erected and then modified to accommodate the plumbing and electrical components. The original latrine plan called for the type described in *AFM 86-3*, which is familiar to many of the Korean War era; however, in keeping with our policy of providing every possible convenience, the latrines were later modified to contain conventional plumbing fixtures. The showers used regular shower heads with individual on / off valves and, therefore, would not waste as much water as the Harvest Eagle shower / shave unit which runs continuously.

As an interim measure, waste water from the showers and laundries would be allowed to drain into French drains (holes filled with gravel) under each unit. This action allowed for the flushing and restoration of existing sewer lines and the construction of a three-stage sewage treatment plant which would be jointly constructed by RED HORSE, Eglin AFB Civil Engineering and civilian contract. Contract portable chemical toilets were to be used until the complete sewage system was finished.

The sewer plant consisted of three ponds formed by earthen dikes. The dikes were first lined with six inches of local clay and then a nylon reinforced rubber membrane. The ponds would allow for

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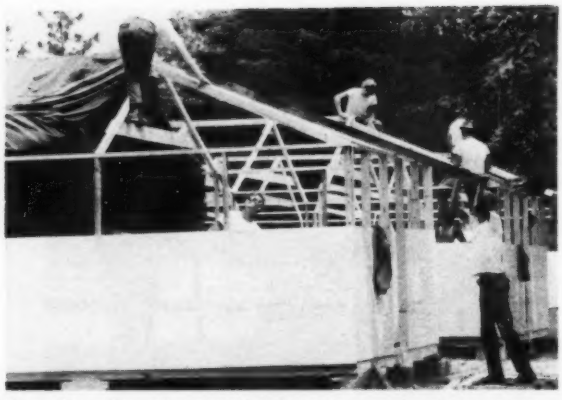
aeration, clarification or separation of solids, and chlorination of the effluent. Final disposal was provided through a combination of soil percolation and a spray irrigation field. The plant was inspected by officials from the Environmental Protection Agency (EPA) shortly after it was placed in operation. The quality of the effluent, the low cost and the short construction time—less than 10 days—so impressed them that they asked permission to use the plant as a model to show what can be done with a limited budget in a minimum of time to meet the EPA standards.

As the operation transitioned from planning to construction, initial work assignments were modified to take full advantage of individual unit skills, capabilities and resources.

Although the erection of tents were RED HORSE's main task, other assignments were given as the initial plan was expanded and improved to meet each new facet of the rapidly developing project. One such task was the erection of three prefabricated metal buildings for storage of baby foods and other supplies.

On 29 April the decision was made to reactivate the abandoned runway at Field #2 in order to facilitate a faster flowing logistical pipeline. While Eglin AFB Civil Engineering personnel prepared the runway, RED HORSE's electrical personnel began to install the recently tested HARVEST BARE Airfield Lighting System. The entire system consisting of approach, VASI, strobe and distant marking lights, was operational in only 18 hours. Preparation of the airfield pavements required cleaning the pavements of weeds and grass that had grown through the asphalt; patching of several cable trenches that had been opened in support of the research and development test; and painting of all centerlines and airfield markings. Weed removal was accomplished using tractor-towed mowers followed by graders to clean the area to bare pavement. Use of the graders

A spirit of cooperation prevailed among civil engineering personnel as they worked to complete each job efficiently.



After sidewalls and supporting trusses were in place, canvas roof tops were positioned in place by personnel.

provided a secondary benefit by removing unwanted airfield marking such as the large "Xs" that indicated a closed field. The first aircraft landed at Field #2 on 30 April 1975, less than 36 hours after the decision was made to reactivate the runway.

The remainder of the RED HORSE electricians was assigned to accomplish the interior electrical work, while Eglin Main constructed the primary and secondary distribution system. The available Harvest Eagle Lighting Kits were used as an expedient measure for the first increment. In subsequent increments and throughout the support facilities, the decision was made to use standard interior electrical wiring and fixtures. The RED HORSE plumbers assumed the task of exterior plumbing and sewer work. This consisted primarily of expanding the water system and making the tie-ins to the existing sewer system.

RED HORSE equipment operators provided the initial movement of equipment and supplies. As other agencies assumed many of the hauling tasks, the RED HORSE crews moved to other tasks such as improving existing roads and the building of new ones. They were responsible for digging French drains for the showers and laundries, and also for digging hundreds of yards of trenching for installation of new water and sewer lines. Also, they performed the initial earth work for the three-stage sewage treatment plant.

Through re-evaluation of personnel resources, RED HORSE and Prime BEEF plumbers were made available to augment the Hurlburt Field Civil Engineering shops in the fabrication and installation of interior plumbing systems. This action freed 834 CES personnel, with skills not related to plumbing, to assist RED HORSE in tent erection. Personnel in the electrical career fields assisted crews from the 3202 CES in the installation of primary and secondary electrical distribution systems. In addition, 834 Supply and Entomology personnel joined with RED HORSE, 3202 CES and TDY crews organized to provide these services.

Although the primary responsibility of the 3202 CES was to prefabricate tent sections, the Squadron

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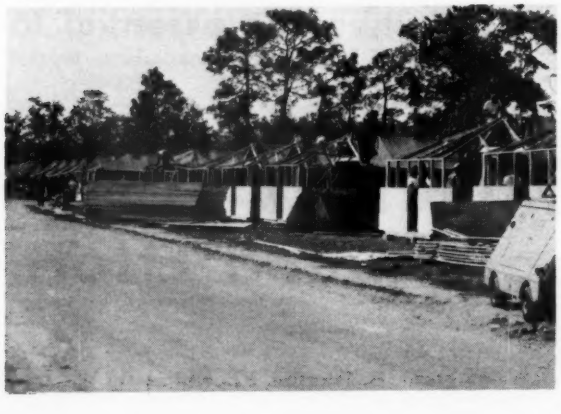
CAPTAIN DAVIS *is Chief of the Operations and Maintenance Division, 834 Civil Engineering Squadron, Hurlburt Field, Florida. A graduate of the US Air Force Academy with a bachelor's degree in civil engineering, he is an Engineer-In-Training in Colorado.*

soon assumed many other normal civil engineering support-type functions. Bulletin boards, clothes line frames, shower benches and picnic tables were constructed. The base sign shop worked around the clock to keep up with the demand for the myriad of signs that are necessary to the operation of any installation. In this case, the signs had to be in Vietnamese or were bilingual. Although field kitchens were used, they required considerable plumbing and electrical wiring as well as back-up power units for emergency use. This support came from the base shops. As the kitchens began operation, it became obvious that the grease traps specified in *AFM 86-3* would be inadequate for sustained operation. Solution of this problem was handed to the 3202 CES as was the problem of dust control that became acute as the refugees began to arrive in number.

Normal pest control, trash collection and water and waste services were handled by the Base Sanitation Branch. A sanitary fill operation was established and water lines that had been idle for years were purged and purified. As the systems were made usable, around the clock operation was assumed by the Sanitation Branch which had been augmented by TDY personnel. After the decision was made to convert the latrines to standard plumbing fixtures, the Eglin AFB shops constructed a test module that could be prefabricated in the plumbing shop and quickly installed and made operational in the field.

As construction progressed, the operation moved toward a normal base function. TDY personnel were organized into a Base Engineer maintenance force with an organizational structure paralleling the normal civil engineering squadron. A 24-hour Service Call operation was established with the necessary Do-It-Now crews to provide essential maintenance and repair. TDY personnel assumed primary responsibility for the daily operation and maintenance of the Refugee Processing Center with the 3202 CES providing technical advice and shop backup, as required.

Within days, Tent City begins to take shape. Various activities are being performed.



Neat rows of completed hardback tents are ready to receive the first Vietnamese arrivals within five days.

The "Tent City" was completed on 23 May 1975. From the beginning of the Project New Arrivals, Air Force Civil Engineering personnel were faced with a monumental task. With a minimum of notification, forces were joined to construct a city for approximately 5,000 refugees. In addition to providing living facilities, other facilities were erected for processing, feeding, medical, religious, educational and recreational purposes. The first increment with a capacity for 2,500 was almost complete when the first refugees arrived on 4 May 1975. This was only five days after the project "GO" signal was received.

This accomplishment came about only because of the concerted civil engineering team effort which had excellent support not only from local agencies such as Supply, Procurement and Transportation, but also from local merchants. All of the work was completed in an expeditious, professional manner, in spite of long working hours and conditions which were far from ideal. Through the efforts of this team, and with the outstanding logistical support that it received, the Refugees Processing Center at Eglin Auxiliary Field #2 was completed ahead of schedule, enabling the new residents to begin their transition to a new life.

E&S

The challenge to cooperate and to combine talents, experience and enthusiasm must be met by all levels of base civil engineering and procurement activities. It's essential to effective mission accomplishment.

THE PROCUREMENT PROCESS: A Coordinated Effort

by Maj J. B. Johnson, PE, and Lt W. W. Apple

Approximately $355 million of operations and maintenance (O&M) funds for Fiscal Year 1974 were expended by base procurement activities within the Air Force solely in support of civil engineering functions. Of this total, approximately $147 million were expended for maintenance and repair and minor construction projects, $121 million for other services and $87 million for purchased utilities. The magnitude of these expenditures emphasizes the importance of careful civil engineering/ procurement planning at a time during which "austerity" is a common word in the Department of Defense vocabulary.

While costs of acquisition of new facilities and O&M of existing facilities are affected directly by constantly rising labor and materials costs, there are other less obvious and more indirect effects that are often overlooked. Inadequate purchase descriptions / specifications, failure to establish requirements in a timely manner and failure to communicate during the entire procurement cycle are just a few of the effects that might be minimized by awareness on the part of civil engineering and procurement personnel concerning the problems often encountered in the procurement of both supplies and construction projects.

Supplies and Materials Procurement

The importance of knowing exactly what is required in the area of supplies and materials procurement cannot be overemphasized. The civil engineering activity must translate work orders and job orders into firm requirements. Hence, a great burden is placed upon the civil engineer to provide the essential physical and functional characteristics of the requirement for procurement action.

Current procurement directives, specifically the Armed Services Procurement Regulation *ASPR 1-1206.1*, provide extensive guidance in the area of purchase descriptions. The minimum acceptable purchase description would generally be a "brand name or equal" designation. However, any other information that might express the minimum needs of the Government is desirable, as additional information can assist procurement personnel in obtaining price competition. In cases in which price competition is not or cannot be obtained, adequate information can provide a basis for determining whether a price quoted is or is not reasonable. Such additional information might include common nomenclature; kind of material, i.e., type, grade and alternatives; electrical data, if any; dimensions, size or capacity; principles of operation; restrictive environmental conditions; intended use, including location within an assembly and essential operating conditions; equipment with which the item is to be used; and other pertinent information that further describes the item, material or service required.

Sole source procurements are sometimes essential when, for example, a component part of existing equipment manufactured and sold by only one source must be obtained. Procurement personnel understand and appreciate this type of requirement and can assist the civil engineer in preparing the justification that is required by law. *ASPR 3-210.2* defines a sole source of supply existing "when supplies or service can be obtained from only one person or firm."

Obviously, not all requirements are needed within the same time period and not all requirements can be planned months in advance. Partially for this reason, the base supply system allows for assignment of priorities to various requisitions. As *Figure 1* illustrates, the assignment of these priorities is based upon numerous factors, including force / activity designation and urgency of need. A requisition for an item in support of a combat activity that cannot perform its mission until the requirement is fulfilled, will and should be assigned a higher priority of the combat activity. The duty of civil engineering

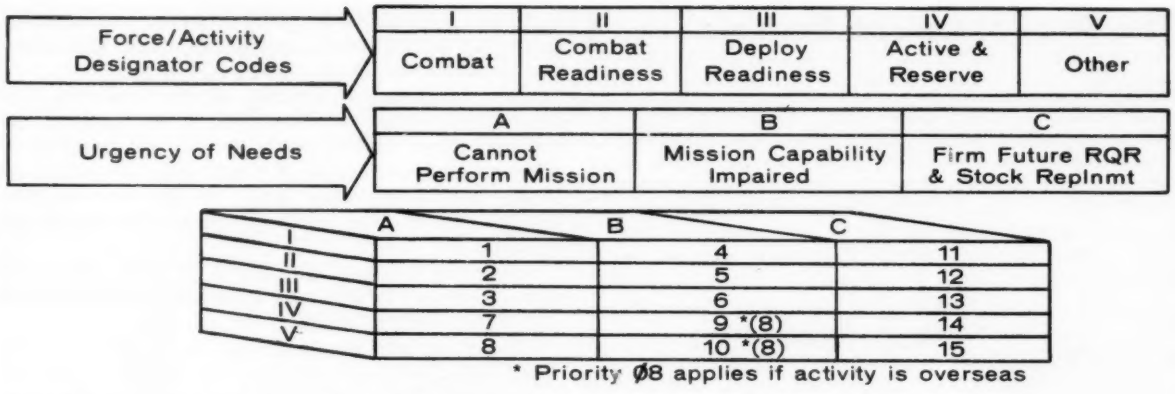


Figure 1: Assignment of Priorities to Various Requisitions.

personnel in this respect is to communicate to base supply personnel both urgency and mission supported in order that a higher priority may be assigned, if justified.

What do these priorities mean to procurement personnel? They enable them to establish time parameters within which purchase action must be accomplished and the item must be received by base supply. For priorities 1-3, 12 days are allowed. For priorities 4-8, the target is 18 days, while the permissible time for priorities 9-15 is 45 days. Based on the priority, the computer has been programmed to flag an item for followup action after the estimated delivery date (EDD). Followup for a priority 1-3 requisition will be initiated EDD plus one day; priority 4-8 will be flagged EDD plus three days and priorities 9-15 at EDD plus five days. Thus, priority assignment is critical in obtaining an item and how many days past the due date the computer will flag an item for followup action.

Procurement of Construction Projects

In contracting for construction, pre-procurement review of drawings and specifications with the procuring contracting officer (PCO) can and does save both time and defense dollars. Such review might, for example, uncover common problems of specifications that are unclear or conflict within themselves or with required contract clauses. Specific aspects of the plans might be affected by current market conditions. While the PCO cannot match the engineering knowledge of the civil engineer, he can nonetheless contribute his knowledge of contracting problems and market behavior.

Once specifications and drawings are in final format, timeliness becomes a critical factor. Construction procurements with an estimated dollar value in excess of $2,000 normally require from 45 to 75 days between the time of submission to procurement and contract award, depending upon the dollar value and complexity of the requirement. In addition, contractor mobilization time must be considered before construction will actually begin.

Key Phases Dependent on Engineer

Within the 45 to 75 day time period prior to award, certain key phases in the contracting process are dependent upon the civil engineer. From the beginning, no requirement can be considered to be "in the hands of procurement" until all components of the requirement are submitted. A purchase request (AF Form 9) alone may not be all that is required to initiate purchase action. Drawings, specifications, liquidated damages formulae,. descriptions of Government furnished equipment or property and other information play an important role in determining the contents of a solicitation or a request for proposals (RFPs).

Granted, there are approximately 50 contract clauses that are considered to be "required clauses" for fixed-price construction contracts. The last update of the ASPR made Value Engineering a "required

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The Procurement Process

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clause" in construction contracts. But once the "boiler-plate," as these clauses are often called, is incorporated, there remain approximately 59 clauses which may or may not be suitable for incorporation into the invitation for bids. The contracting officer must make decisions at this point that will largely determine the quality and timeliness of completed construction. Civil engineers should be familiar with these clauses and furnish all available information to make these decisions.

The Procurement Process

Many steps are involved in the procurement process prior to issuance of the solicitation or the RFPs. Although the number of steps and the time allocated to each may vary with each purchase, an overview of some of these steps might substantiate the need for timely pre-procurement planning and submission of requirements.

After receipt and review of the purchase request and accompanying documents, solicitation procedures begin. Requirements which may result in an award in excess of $10,000 must be publicized or "synopsized," in a publication entitled *Commerce Business Daily,* a publication of the US Department of Commerce. The solicitation or RFP preparation that follows may include preparation of a written determination by the contracting officer that a requirement can be negotiated pursuant to one of the 17 exceptions to the requirement for formal advertising. If the requirement is to be advertised, coordination with the Small Business Office or Small Business Specialist assigned to the local installation, must be accomplished to determine if the solicitation should be set aside for small business participation only. Other actions, such as determination of bid bond and required performance bonds, must be made and incorporated into the solicitation.

Once the solicitation is drafted, an internal review procedure within the procurement office begins. Then final preparation is made to reproduce the solicitation and mail copies to a sufficient number of qualified firms to encourage openly competitive bidding. Base engineers should suggest firms that are qualified to receive the solicitations.

During the bid period, engineers should take care that in answering telephone or other inquiries they do not provide an unfair competitive edge to a bidder. Keep the procurement officer advised so that he may issue an amendment if necessary and avoid a protest of award.

Once bids are received and abstracted at a preestablished time and place, the task of evaluating bids for responsiveness and bidders for responsibility begins. If a bid is considered responsive, it conforms to the requirements of the solicitation; if a bidder is considered responsible, he is considered to possess the necessary financial capability, experience, technical qualifications, organization, satisfactory record or performance judgement, skills and other qualifications necessary to perform the job.

Prior to contract award, coordination with the local Staff Judge Advocate may be required to determine legal sufficiency of contractual documents. Payment and performance bonds must be obtained from the contractor and review by higher headquarters may be required prior to final execution of award.

Once the contract is awarded, a notice of award must be drafted as well as a written notice to proceed with work required by the contract.

A pre-preformance conference is normally held to discuss specific requirements of the contract with the contractor and to brief him on local security, fire protection and safety requirements and hazards. The contributions of the civil engineer at this event can contribute to a smooth mobilization and commencement of work by the contractor. AF Form 3035, Pre-performance Conference and Pre-final Payment Checklist, outlines subjects to be covered.

The Continuing Interface

At early stages of the project, the civil engineer is involved with approval of progress charts and evaluation of material approval submittals for compliance with contractual provisions. While the contracting officer is tasked with final approval of both of these, the decision to accept or reject is placed largely upon the shoulders of the civil engineer.

As the project continues, the function of the project engineer and other construction management personnel as Technical Representatives of the Contracting Officer (TRCOs) acquires special significance. *AFR 70-9* confirms this important role to the degree that the Base Commander is required to "insure that TRCOs and alternate TRCOs are not assigned additional duties which will interfere with the surveillance of contract operations." The TRCO must exercise care that any dealings with the contractor are not construed as a constructive change to the contract. As the "eyes of the contracting officer," though, he is the true determinant of the quality of work demanded and received by the Government.

Conclusion

Certainly the procurement process—from the drafting of the requisition to the final acceptance of the requirement—is a coordinated effort. The base procurement and civil engineering functions are essential to effective mission support and, therefore, essential to effective mission accomplishment. For this reason, the challenge to cooperate and to synergistically combine talents, experience and enthusiasm must be met by all levels of both activities.

E&S

The Military Family Housing U-Fix-It Store

In today's environment of resource scarcity, there is a need, more than ever, for entrepreneurial effort of the highest order. Here's a success story that can be multiplied many times over provided the setting is right, the store operation has the full support of top level management and the storekeepers have the skill and motivation characteristic of their private sector counterparts.

by Col Sheldon J. Lustig, AIP

The U-Fix-It store at Vandenberg AFB, California, opened for business on 19 June 1973. The idea was not original for there are few ideas that can be classed as such. In fact, it has already been tried at more than one location. A formal test began a year earlier at McGuire AFB, New Jersey; however, the results were inconclusive. A similar store had been in operation at Westover AFB, Massachusetts, in 1972 before Strategic Air Command (SAC) host base management was terminated. Finally, in late 1973, Headquarters US Air Force directed major commands to formally test and evaluate the self-help concept.

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U-Fix-It *cont'd*

Vandenberg AFB was one of two SAC bases selected for the test since the store operation was already in full swing and showed early signs of success. After almost two years of continuous operation, the store is now a permanent fixture on the base and complements one of the 4392 Civil Engineering Squadron's (CES's) prime managerial aims: to please its customers. As one so aptly remarked, "The U-Fix-It store is the best idea since the Air Force discovered the airplane."

What follows are the answers to those basic questions that should be asked before a U-Fix-It store is opened at your base. Why is it needed? What makes it work? How does it operate? Where should it be located? Who does it benefit? But first, it is important to express the underlying assumption that proved to be valid at Vandenberg AFB: given the incentive of free advice, tools and materials, many military families occupying Government owned quarters are capable of, and more than willing to make minor repairs themselves.

Why Is It Needed?

From time to time, the Air Force goal to foster a spirit of homeownership among military family housing occupants has been expressed to augment limited civil engineering manpower resources. Generalized goal statements of this kind are far more meaningful if they are translated into more precise objectives and are accompanied by action oriented plans that address a specific need to improve performance. The management by objectives program guidance and policies recently initiated by the Directorate of Civil Engineering, Headquarters US Air Force, letter of 18 December 1974, provided an excellent planning method for establishing a U-Fix-It store.

In a very practical sense, the 4392 CES management was faced with such a real world need. Military Family Housing (MFH) maintenance downtime was too high, job order backlog was too large and occupancy rates were being adversely affected. Criticism was being leveled by customers as well as staff visitors from high headquarters. One of many elements of a comprehensive improvement plan included the establishment of a U-Fix-It store. It was not unrealistic to postulate that a successful store operation would go a long way to spur self-help minor repairs by occupants, allowing civil engineering craftsmen to do the more difficult repairs. The net result of this homeownership attitude should fulfill, in part, the need to make our limited civil engineering resources count the most and improve turnaround time and occupancy rates.

What Makes It Work?

Tangible and intangible ingredients are necessary to a successful U-Fix-It store operation. The latter are far more important than the former. Of paramount importance to a successful store operation is the selection of the right storekeeper. More than anything else, the measure of success will depend heavily on entrepreneurial skill and motivation. The technical skill of a storekeeper should enhance an overriding enthusiasm to help the willing patron. The personal support of the Base Civil Engineer is an absolute must, and it has to go beyond just words of encouragement. There are times when his personal involvement is necessary to get things off "dead center" and to acquire some of the tangible

SSgt Ed Gold (left), storekeeper of the Vandenberg AFB U-Fix-It-Store, explains how to repair a commode.

necessities required to make the store more successful. Especially at the start, a full scale advertising campaign is important. The base newspaper and flyers announcing the store opening are essential for passing the word. Newcomers orientation lectures can make recent arrivals aware of the store's purpose. Finally, MFH Management Office personnel can be a continuing source of information about the U-Fix-It store operation.

Sufficient store space is needed for displays, instructional aids and stock storage. A small outdoor open storage area with unheated shed is suitable for storing fence material and landscape maintenance supplies. Wall charts can be used for illustrating component cutaways of showerheads, commodes and faucets. An actual commode and sink mounted in the display area is ideal for training purposes. There is no substitute for first hand instruction by a trained mechanic on the real thing.

How Does the Store Operate?

There are a few prerequisites to the operation of the U-Fix-It store. Procedural simplicity and a customer orientation are first and foremost. Some means of customer feedback and a degree of flexibility are also essential to account for differences among bases. Convenient store hours and the right stock and tools available for loan are important to satisfying patron needs. Simple procedures for cost accounting and systematic checks and controls to prevent unauthorized issues are also necessary.

Organizational placement ought to be optional. The Vandenberg AFB store was assigned to the Operations and Maintenance Branch; however, it might operate equally well as an element of the Family Housing Management Branch.

Customer preferences can be ascertained either by asking them first hand or soliciting their written comments on some type of service evaluation and suggestion form. The AF Form 1255 can be used even though some of its questions are not applicable. Taking the pulse of the base's customer desires resulted in store hours of operation from 0730-1700 Tuesday through Friday and 0800-1200 on Saturday. Also, stocks and the type of tools available for loan were adjusted. The proper tool for the job at hand often makes the difference between a reluctant do-it-yourselfer and a manhour saver for the civil engineering workforce.

Like it or not, there is a need for some system of cost accounting. When ordering supplies, separate Collection Work Order Numbers (CWON) were established for each of the following Cost Account Codes (CAC):

DESCRIPTION	CAC
Fence Material	X6200
Fertilizer and Seed	X8100
Interior Paint	X6402
Other Supplies	X6200

Since it is more practical for the Grounds Foreman to bulk order all fertilizer and seed under work order

Sergeant Gold explains to a customer how a faucet valve seat is replaced in a standard bathroom fixture.

00003, Organization Code 900 RG, CAC 59010, the U-Fix-It storekeeper can draw from the same stock and transfer the cost, using AF Form 1469, in order to properly account for family housing expenditures and affect stock replenishment. A designated controller can account for all store labor expenditures using Labor Utilization Code (LUC) 19-3 and CAC C6200. An Actual Time Accounting (ATA) cost center was established at Vandenberg AFB to keep track of all labor costs associated with store operation and maintenance.

A few simple controls are needed to prevent abuse. A master list of family housing occupants and their street addresses can be provided by the Family Housing Management Branch to insure that only authorized personnel are issued materials. A card is maintained for each housing unit. Each item issued is recorded and signed for by the occupant. Reasonable limits are placed on issues of grounds maintenance supplies and fence materials. During pre-termination inspections, housing inspectors check issue cards

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Several types of equipment are dispensed by the U-Fix-It Store for use by tenants to perform minor repair.

U-Fix-It *cont'd*

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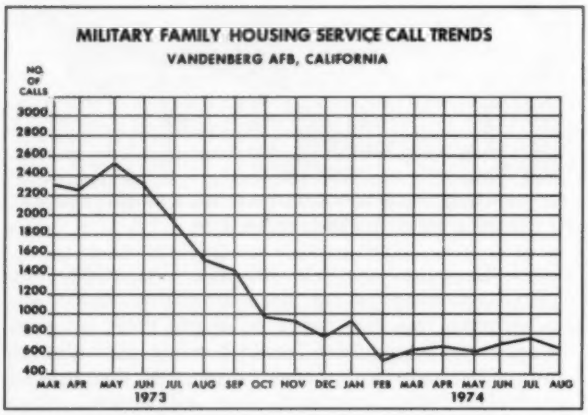


Service Call Trends from March 1973 through August 1974.

against work in place to assure that the quality of work is satisfactory.

Materials are not issued for work that may exceed the occupants' capability and for house improvement self-help work requiring an approved AF Form 332 (*AFR 91-1,* para 9). So much for administrative accounting and contols.

Where Should the Store Be Located?

The right location is an important consideration for any enterprise, private as well as public. Just as accessibility is a crucial factor affecting the economic feasibility of a commercial venture, convenient access to the U-Fix-It store will influence customer acceptance and use. Since the automobile is a "way of life" in our society, the store need not be located in the family housing complex itself. An excellent location is a heavily traveled base road used by a large segment of the base population. A central location is important if there is more than one area. Ideally, co-location with the Family Housing Management Branch affords a bonus advantage because it facilitates a convenient orientation opportunity for newcomers.

The salient question of all must address the store's payoff. There are three significant potential benefits. First, the dramatic reduction in calls for service by housing occupants at Vandenberg AFB, after store opening, can be calculated as an annual net savings of more than $100,000 in equivalent civil engineering craftsmen's time. Once the store opened for business and a concerted advertising campaign was mounted, a steady decline in calls for service occurred. An average monthly rate of 2,400 beforehand, eventually leveled out at 700. Therein lies the most tangible and measurable benefit. Second, the image of the civil engineering organization improved in the eyes of its customers. By providing free advice from motivated, technically competent craftsmen, minor routine repairs can be done by occupants, on their time and at their travel expense. Sometimes, more than one trip to the store is needed for more instruction, the right part or the more efficient tool. Finally, there has to be an immeasurable sense of satisfaction and pride that the customer derives from successfully "fixing it himself."

After more than two years of operating experience at Vandenberg AFB, the U-Fix-It store has paid important dividends in terms of reducing service calls, fostering a spirit of homeownership and improving the 4392 CES image among its base wide customers. With a Directorate of Civil Engineering waiver to *AFM 85-1,* para 15-4a, (procedures governing self-help work), all SAC bases were encouraged to establish a store. Whether they succeed will depend heavily on the selection of the right storekeepers, the personal support of the Base Civil Engineer and an effective advertising campaign. Now that the whys and wherefores have been covered, all that remains is a decision to establish a U-Fix-It store as one of your management objectives.

E&S

U-Fix-It Store storekeepers inspect all incoming stock and tools before they are stocked in appropriate bins.

Projected End of Summer Positions

The following list contains the names of civil engineering colonels and their current and projected positions (as of the end of the summer). Because of early publication deadlines, this list is current as of 1 July 1975. Some changes may have occurred since the list was submitted for publication.

NAME	POSITION
Abelman, Robert M.	SAC / Warren
Adamo, Joseph	U-Tapao
Alkire, Melvin G	USAFE / DE-2
Allison, Thayer W.	Eglin
Amerio, Umberto M.	PACAF / Kadena
Auld, Harry E.	USAF PREP
Beck, Edward M.	SAC / Loring
Beckwith, Wayne K.	COMUS Japan
Bell, Herbert E. (Bio-Envir)	USAF / PREVP
Blanton, Eugene T.	AFRCE-WR
Bolton, Howard F.	AFLC / DE-2
Borowski, Eugene C.	SAC / 8AF / DE
Brame, Horace L.	AAC / DE
Brennecke, Harold J.	MAC / Altus
Burkett, William M.	AFSC / DE-2
Busick, Charles P.	TAC / Holloman
Caldwell, James H.	MAC / DEP
Carey, Robert L.	AFLC / McClellan
Catlin, John E., Jr	USAFE / DE
Choromokos, James J.	USAFE / DER
Coffee, Kenneth H.	ADC / DEM
Colvin, Thomas E.	TAC / DEP
Cooper, Kenneth M.	ATC / DEH
Corrao, Nicholas A.	SAC / March
Correll, Charles A.	MAC
Crisp, Harold N., Jr	TAC / DER
Cunningham, John T., III	USAF / PREM
Deleon, Mike	ATC / Randolph
Deluca, Jerry J.	PACAF / DEP
Deneke, William L.	AF NGB / DE
Dixon, Robert E.	SAC / Barksdale
Dominquez, Luis F.	USAF / PREV
Doran, Donald A.	SAC / Plattsburgh
Dunwoody, Richard H.	TAC / 823CES
DuPree, Forest G.	PACAF / Clark
Edwards, David J.	AU / Maxwell
Ellis, George E.	USAF / CESMET
Emmons, John E.	AFLC / Robins
Fears, Walter H.	ATC / Lowry
Ferree, David F.	HQC / Bolling
Fiden, Thomas J.	SAC / DEF
Fluhr, Wallace E.	USAFA / Faculty
Foster, Herbert R.	MAC / DEM
Frias, Reynaldo	Norton IG
Gagnon, Raymond C.	USAF / PREP (ANG)
Garren, Roland R.	AFSC / Arnold
Geer, Richard P.	ATC / DEP
Gifford, Robert N.	ADC / ENT, Peterson Fld, CO
Glover, Allison G.	AFSC / DE
Gores, Vernon D.	AFLC / DER
Gracey, Robert H., Jr	SAC / Offutt
Harding, Robert C.	TAC / 820th CES
Hartmann, Arthur J.	AFLC / DEM
Hartung, Paul T.	MAC / DE
Hawkins, James R.	SAF / ILI
Hedge, Thomas L.	SAC / DEE
Hinz, Richard H.	PACAF / DE
Hobbs, Terrence E.	USAF / PRER
Hollingsworth, Joe B.	SAC / Ellsworth
Howard, David R.	MAC / Travis
Iten, Robert M.	AF / CEC
Jacobs, Frederick R., Jr	TAC / Little Rock
Key, Sydney E.	AFRCE / Dallas
Kinder, Morris B.	USAFE / DEP
King, Leonard A.	SAC / Malmstrom
Klingensmith, Robert R.	PACAF / Osan
Lamb, Charles W.	ATC / DE
Lemons, Roy D.	AFSS / DE
Liddicoet, William B.	AFSC / AFWL
Lustig, Sheldon J.	SAC / DE-2
Lytle, Lowell C.	MAC / McChord
MacKenzie, James S.	AFIT / WPAFB
Macoubray, James G., III	MAC / McGuire
Magazu, Harry H.	SAC / DEP
Marr, James F.	SAC / Fairchild
Martino, Salvatore	SAC / Vandenberg
McMullen, Philip C.	AFSC / DEP
Morison, Joseph S.	ATC / Keesler
Morton, Allan W.	AAC / Elmendorf
Munsie, Lawrence, Jr	MAC / Scott
Murray, Edmund F.	SAC / Dyess
Mussetto, Elo	ATC / DE-2
Nielson, Roger W.	PACAF / 5AF / DE
Pearson, Morris W.	TAC / Nellis
Plack, Richard P.	HQC / DE
Poad, William J.	USAF / PREE
Porter, Leroy C., Jr	13th AF / DE
Potter, Frederick R.	USAFE / DEO
Pratt, Clinton E.	TAC / DE
Rains, William E.	TAC / DE-2
Reaves, Donald R.	USAFA / DE
Reining, Robert R.	HQC / Andrews
Reynolds, P. G., Jr	AFLC / Tinker
Richardson, Dewey E.	MAC / Norton
Robb, William G.	AFLC / WPAFB
Roesener, Arlie K.	SAC / 2nd AF / DE
Rubenstein, Morris B.	ADC / DE
Snider, Henry G.	PACAF / Hickam
Strom, Oren G.	AFSC / Kirtland
Taylor, Daniel D.	15th AF / DE
Thomas, John P.	AFLC / Kelly
Tissaw, George H.	USAF / PREPA
Troutman, Ray K.	AF / RES
Turner, Joseph G., Jr	SAC / Davis-Monthan
Villone, Victor J.	AFSC / DEE
Waldren, David L.	SAC / Griffiss
Walters, Marvin L.	ATC / Lackland
Winslow, Joe G.	PACAF / 554th CES
Winter, Charles T.	SAC / Castle
Wilson, James R.	SAC / Pease
Woods, Donald R.	AFCS / DE
Wright, Clifton D., Jr	SAC / DE

READERSSURVEY RESULTS

Perhaps the most satisfying product of the Readers Survey questionnaire published in the November 1974 issue of the Air Force Civil Engineer, was the overwhelming response by civil engineering personnel worldwide. It was overwhelming because less than 4,000 copies of the Journal are distributed to the entire civil engineering workforce of approximately 70,000 persons.

For purposes of this survey analysis, we selected the total professional civil engineering workforce of 5,487 persons as the basis for the analysis. Because of the low number of issues distributed, the questionnaire was also reproduced and mailed to all major commands to assure the opportunity of more people responding. Thus, a total of 1,237 responses was returned which means a return response of 22.7 percent. Broken down further, there were 656 out of a total of 2,050 military who responded for a 32 percent response and 581 out of a total 3,437 civilians who responded for a 16.9 percent response.

Overall, there were no startling surprises; however, there were several interesting observations to come from the survey. For one, at least 65 percent of the total professional force read all or more than half of each issue. Also, the preferences of subject matter fell into this sequence: engineering related articles drew the heaviest response, 79.9 percent, followed by operations and maintenance; management; education and professional development; environment and ecology; utilities and services; housing; agronomy; and entomology.

One area of the overall survey showed our biggest weakness to be distribution. It came as no revelation. A very high 39.3 percent rated distribution from fair to poor. Our reaction is that we will attempt to do whatever we can to solve this problem of apparent slow and / or lack of distribution.

The editorial staff of the Journal wants to express its appreciation to all who responded to this survey.

TOTAL RESPONSES VS TOTAL PROFESSIONAL FORCE AND THEIR PERCENTAGES

				Percentage
Total Mil Respn	656	Total Mil Prof Force (Duty AFSC 55XX-Jan 75)	2050	32.0
Total Civ Respn	581	Total Civ Prof Force (GS-9 & above-Jan 75)	3437	16.9
Total Responses	1237	Total Prof CE Force	5487	22.7

HOW MUCH OF THE AIR FORCE CIVIL ENGINEER JOURNAL IS READ:

	All of It	More Than Half	Less than Half	Hardly Any	No Response
Total Resp	238	570	300	61	68
Percentage	19.3	46.0	24.3	4.9	5.5

BREAKDOWN OF RESPONDENTS

Military	
BGen	1
Col	32
Lt Col	84
Major	146
Captain	185
Lieutenants	137
Enlisted	56
No Response	15
Total	656

Civilian	
GS-10 & above	474
GS-9 and below	67
Wage Board	19
No Response	21
Total	581

ARTICLE PREFERENCES

	Like	%	Don't Like	%	No Resp	%
1. Engineering	988	79.9	45	3.6	203	16.4
2. Operations & Mainten	930	75.1	85	6.9	222	17.9
3. Management	920	74.3	79	6.3	238	19.2
4. Education & Prof Dev	878	70.9	70	5.6	289	23.3
5. Research & Development	837	67.6	116	9.3	284	22.9
6. Environment & Ecology	801	64.7	112	9.0	323	26.1
7. Utilities & Services	753	60.8	145	11.7	339	27.4
8. Housing	617	49.8	191	15.4	429	34.6
9. Agronomy	345	27.8	342	27.6	549	44.3
10. Entomology	329	26.5	363	29.3	544	43.9
11. Other	205	16.5	57	4.6	975	78.8

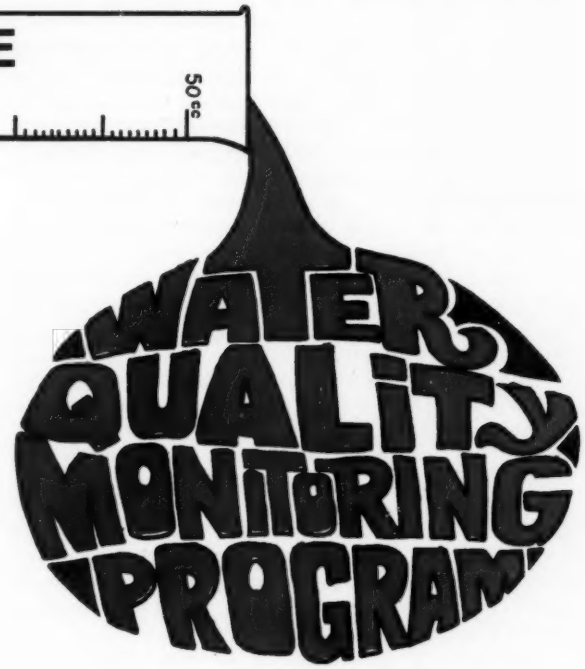
HOW STANDING DEPARTMENTS WERE RATED:

	Excell	%	Good	%	Fair	%	Poor	%	No Resp	%
1. Current Emphasis	480	38.8	531	42.9	83	6.7	5	.4	138	11.1
2. Worth Noting	352	28.4	597	48.2	122	9.8	6	.4	160	12.9
3. From the Director	314	25.3	602	48.6	134	10.8	12	.9	175	14.1
4. Letters to Editor	146	11.8	554	44.7	295	23.8	52	4.2	190	15.3

HOW THE JOURNAL WAS RATED:

	Excell	%	Good	%	Fair	%	Poor	%	No Resp	%
1. Printing & Paper	665	53.7	422	34.1	43	3.3	7	.5	101	8.1
2. Photographs	476	38.4	530	42.8	119	8.6	10	.8	102	8.1
3. Graphics	475	38.3	534	43.1	101	8.1	10	.8	117	9.4
4. Overall	428	34.5	677	54.7	52	4.0	5	.4	75	6.1
5. Editorial Content	273	22.0	646	52.2	171	13.8	12	.9	135	10.9
6. Distribution	210	16.9	429	34.6	294	23.7	194	15.6	110	8.8

THE AIR FORCE ACADEMY



by Lt Col Sterling E. Schultz, PE

The United States Air Force Academy (USAFA), in its setting of natural grandeur and academic environment, established a comprehensive and forward looking water quality monitoring program five years ago. Today that program continues to be exemplary. The range of monitoring activities includes measurements of pollutant sources and ambient quality of surface waters. Objectives of the monitoring program have not changed over the years; they are the same today:

- Collect and maintain a record of reliable data which assesses compliance with applicable water pollution abatement measures at the Academy.
- Detect potential water quality problems requiring corrective action before a crisis develops.
- Collect baseline quality data on the relatively pristine water resources entering and leaving the Academy property.
- Cooperate fully with local, state and federal water quality surveillance and management programs.

Boundaries of the Academy enclose some 28 square miles of area comprised of broad mesas, valleys and forested ridges. The property is crossed by 10 surface streams and dotted with five lakes and four irrigation reservoirs. The streams are tributaries of Monument Creek in the headwaters of the Arkansas River drainage basin. Monitoring the quality of these water resources is necessary in the light of Colorado's anti-degradation statement requiring waters exceeding limits of their classification standards to be maintained at their existing quality. Establishment of a quality baseline for these pristine streams entering the Academy is important for another reason. Housing developments are being constructed at a phenomenal rate on land areas immediately adjacent to the Academy property. Land use projections prepared by the Pikes Peak Area Council of Governments show the surrounding areas to be built over in another 10 years. Monitoring records will establish when, where and how a quality change takes place as these ranch lands are converted to housing developments.

A series of 11 stream sampling stations have been established at boundary lines, stream junctions and flow gaging stations on Monument Creek and its tributaries as they fan out over the Academy property. The pattern of changing quality, reflected by the relationship between stations, is more important than the isolated quality at any one station.

Sampling stations are also sited at lakes and

cont'd next page

Monitoring the Water Quality of a Reservoir

ACADEMY *cont'd*

nonpotable water reservoirs. There is an interest in monitoring their quality too. For example, Iceberg Lake is used for cadet water survival training and all lakes are stocked for recreational fishing. The nonpotable reservoirs are supplied with pumped ground-water and sewage works effluent from May through October for spray irrigation of athletic fields, parade grounds, golf course, roadway medians and cemetery. Bubble aerators have been added to increase oxygen levels in the reservoirs for sustaining fish propagation. Sampling has been increased at the reservoirs to intensively survey the improvement in water quality with oxygenation.

A schedule of surface water sampling is followed year around. Once a week samples are collected from Monument Creek at three locations. One sample is taken from upstream where the water enters the Academy property (Station 1), another from immediately below the mixing zone of the sewage treatment plant outfall (Station 14), and the third downstream, where the water leaves the Academy property (Station 2). A second group of samples is taken in February and August at all 14 sampling stations in the surveillance network.

Analysis of the water is a cooperative effort among personnel of Environmental Health Services and the Sewage Treatment Plant whose acceptance of responsibility and spirit of cooperation have contributed to the success of the program. The Environmental Health Laboratory at Kelly AFB, Texas, cooperates fully by accomplishing metals and nutrient analyses on 14 samples semi-annually. In addition, USAFA cadets enrolled in water and wastewater courses in the civil engineering major have the opportunity to participate in the monitoring program and resultant special studies.

Testing procedures are in accordance with *Standard Methods.* On the weekly stream samples, a Physical Science Technician (56350) performs field measurements of temperature, PH and dissolved oxygen. In the laboratory the following tests are performed: settleable and suspended solids, five-day biochemical oxygen demand, chemical oxygen demand, turbidity, oil and grease. The samples collected twice a year are subjected to the same series of tests in the laboratory and duplicate samples are forwarded to Kelly AFB.

An Environmental Technician (90750) collects and accomplishes *in-situ* measurements of temperature, PH and dissolved oxygen at the time the samples are collected for shipment to Kelly AFB. In addition, he

Airmen perform in-situ analyses of dissolved oxygen, PH, and temperature at Station 14 below mixing zone at sewage treatment plant outfall.

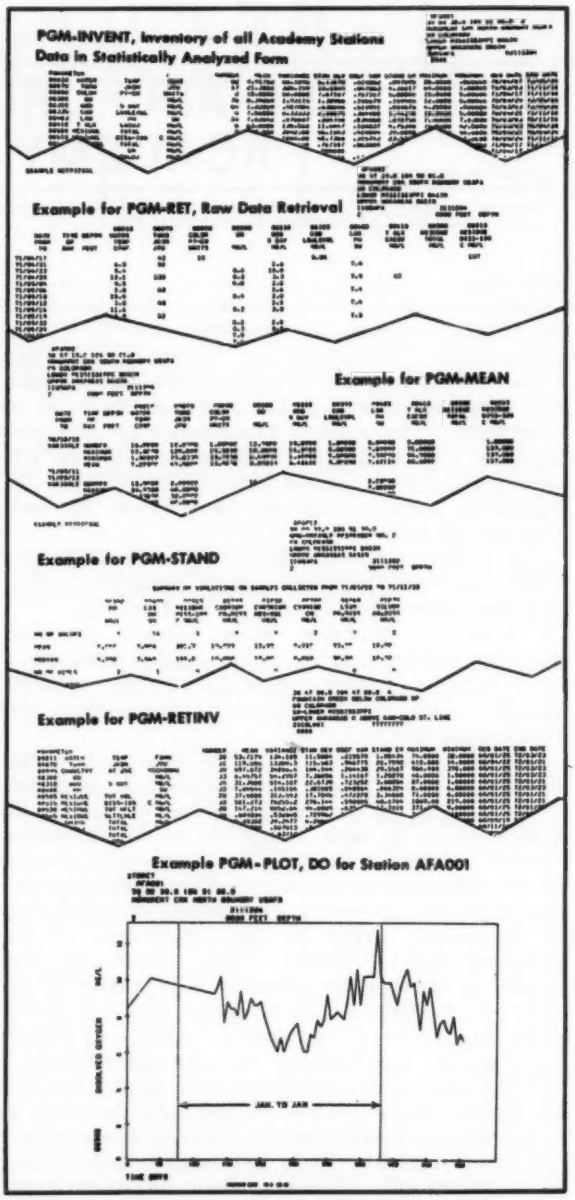

PGM-INVENT, Inventory of all Academy Stations Data in Statistically Analyzed Form
Example for PGM-RET, Raw Data Retrieval
Example for PGM-MEAN
Example for PGM-STAND
Example for PGM-RETINV
Example PGM-PLOT, DO for Station AFA001

Figure 1: Examples 1 through 6, from top to bottom, of STORET data retrieval formats for the Air Force Academy.

(or she) performs fecal coliform analysis on all samples collected under monitoring requirements.

In 1973, Colorado adopted standards for the discharge of wastes and required self-monitoring in accordance with effluent limitations. Monitoring of the sewage works effluent is now established by conditions of the Academy's discharge permit issued by EPA under the National Pollutant Discharge Elimination System (NPDES). Twice a week the concentration of the following parameters must be measured on six-hour composite effluent samples: settleable solids, suspended solids, biochemical oxygen demand, dissolved oxygen, PH, grease, color, turbidity, residual chlorine and fecal coliform count. The Physical Plant Technician accomplishes the testing and reporting.

Records of monitoring activities are maintained and results reported as required by Air Force directives and applicable water pollution control laws. Recorded information includes the date, sample stations, sampling conditions and time of sampling; date analyses performed and by whom; analytical methods used; and results of analyses. The unique feature of the Academy's water quality monitoring program is the utilization of STORET for the storage, retrieval and analysis of all water quality data collected. STORET (STOrage and RETrieval) is the Environmental Protection Agency's computerized central respository for all water quality and related data collected by EPA and cooperating agencies.

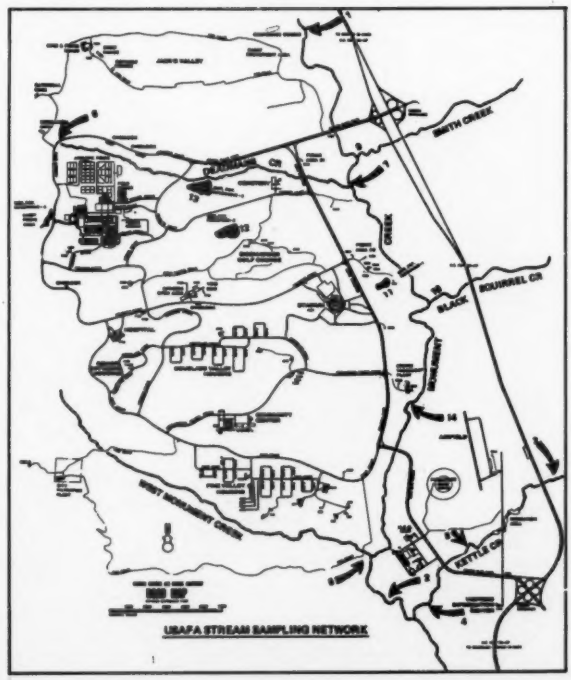
The STORET data handling and storage system makes records of water quality readily available. Academy data in STORET may be retrieved almost instantly and in many types of output format: tabular, graphic or digital plots on maps. As illustrated in *Figure 1,* the system can be queried to provide an inventory of the parameters sampled at any station, *Example 1.* All raw data values for a particular station may be retrieved, *Example 2.* Another useful output is raw data in statistical summary form giving the number of samples and the maximum, minimum and mean values recorded during any particular time period, *Example 3.* STORET will also search the stored data to determine what observations were in violation of standards and provide a summary output, *Example 4.* Users of STORET may retrieve an inventory of combined water quality data stored by all users within a particular geographical drainage basin, *Example 5.* There remains the old adage that a picture is worth a thousand words, so an historical plot of parameters may be obtained for a station, *Example 6,* or parameter statistics may be displayed as a function of stations, e.g., oxygen sag curve for a stream segment.

The Academy initially investigated and used STORET to determine its wider application in finding, extracting and summarizing water quality data which seemed only destined to increase in scope and to become of increased historical importance. There has been no cost incurred in this effort since all Federal agencies are eligible for direct access to STORET without charge. Data may be input over both low speed and medium speed telecommunication terminals or recorded on Standard EPA Forms and mailed to the Regional EPA office. Users of STORET incur no charges for accessing the data base or for using the standard computer programs maintained and supported by EPA. Costs of computer time, data storage and processing are paid by EPA. A user's only costs are for terminal rental charges and telecommunications, if direct access is desired.

Only a few of STORET's capabilities are used by the Academy water quality monitoring program because of the pristine nature of the surface waters and limited number of polluting activities on base. However, the volume of water quality data generated by monitoring activities at other Air Force installations and laboratories may make STORET an attractive and efficient means for processing water quality data.

In conclusion, the Academy's water quality monitoring program is working and it has provided some insight into the utilization of an effective water quality management tool—STORET. C&S

The Academy Stream Sampling Network.



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Society of American Military Engineers Honors Air Force Civil Engineers

Brig Gen Meredith Maj Kishiyama

The Newman Medal for 1974

Presentation of the George W. Goethals Medal to an Air Force Civil Engineer officer for the first time in the 19 year history of the award was a highlight of award ceremonies during the 55th Annual Meeting of the Society of American Military Engineers (SAME) in Portland, Oregon in late April.

Col John E. Catlin, Jr. accepted the Medal from Lt Gen William C. Gribble, Jr, 1974 President of SAME and Chief of Engineers, US Army. Colonel Catlin was recognized for his work as Director of the Bare Base Equipment Systems Program Office at Wright-Patterson AFB, Ohio. The citation to accompany the award read that he "..... provided inspired leadership to the Bare Base Program and successfully initiated and directed a major hardware acquisition program which will greatly enhance the operational capability of our Armed Forces."

The Medal, named in honor of the military engineer builder of the Panama Canal, previously had been won by members from other services or have been civilians. It is presented annually to an engineer in civil or military practice for the most eminent and notable contribution in the field of engineering, particularly in design, construction and methods.

Maj Gen Goddard TSgt Crump

The Maj Gen Guy H. Goddard Medal

Colonel Catlin is currently DCS / Engineering and Services, Headquarters US Air Forces in Europe, Ramstein AB, Germany. His award was one of a total of four presented to Air Force Civil Engineers. Others include:

• Maj Arthur Y. Kishiyama, a Space Transportation System Program Coordinator, Air Force Space and Missile Systems Organization, Los Angeles, California: the Newman Medal for 1974. He was honored for his outstading contributions in military engineering through achievement in design and construction.

The Newman Medal, named in memory of Maj Gen James B. Newman, Jr, a past president of the Society and a past Director of Installations, Headquarters US Air Force, is presented annually to a member of Air Force Civil Engineering for the most outstanding contribution to military engineering through achievement in design, construction, administration, research or development.

• TSgt David L. Crump, 40th Civil Engineering Flight, Aviano AB, Italy: the Maj Gen Guy H. Goddard Medal. He was cited for distinguished contributions to maintenance at his base.

The Goddard Medal is presented annually and honors an active duty enlisted member of Air Force Civil Engineering in recognition of outstanding contributions to military troop construction and / or base maintenance by demonstrated technical and leadership ability. It is named for Maj Gen Guy H. Goddard, a former Director of Air Force Civil Engineering and a past president of the Society. He presented the award to Sergeant Crump.

Lt Gen Gribble Col John E. Catlin

The George W. Goethals Medal

• The 90th Civil Engineering Squadron at F E Warren AFB, Wyoming: the Maj Gen Robert H. Curtin Plaque. The Squadron is under the command of Col Robert M. Abelman.

The Curtin Plaque is given on an annual basis by the Society to the unit within Air Force Civil Engineering selected as the most outstanding during the calendar year. It is named for Maj Gen Robert H. Curtin, a former Director of Air Force Civil Engineering and a past president of the Society.

C&S

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